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Preliminary Results of Post-Disaster Archaeological Investigations at the Kasthamandap and within Hanuman Dhoka, Kathmandu Valley UNESCO World Heritage Property (Nepal)

Coningham, R.A.E.¹, Acharya, K.P.², Davis, C.E.¹, Kunwar, R.B.³, Simpson, I.A.⁴, Schmidt, A.¹ and Tremblay, J.C.¹,

¹ Department of Archaeology, Durham University, DH1 3LE, UK

² Former Director-General of Archaeology, Department of Archaeology, Government of Nepal, Kathmandu, Nepal

³ Department of Archaeology, Government of Nepal, Kathmandu, Nepal

⁴ School of Natural Sciences, University of Stirling, FK9 4LA, UK

1. Introduction

During the 7.8 Magnitude Gorkha Earthquake on the 25th April 2015, one of Kathmandu's oldest monuments, the Kasthamandap, collapsed killing over seventy individuals. In the immediate aftermath of the disaster, the army mobilised bulldozers to recover the dead and the injured and the next day two JCBs were deployed on the ruins (Figure 1). Whilst the earthquake caused a catastrophic loss of life and livelihoods across Nepal and surrounding areas, the damage within the UNESCO World Heritage Property of the Kathmandu Valley was particularly bad. Indeed, a number of key monuments within the medieval Durbar Square at Hanuman Dhoka were damaged and many collapsed. In response, a collaborative team of international and national experts from the Department of Archaeology, Government of Nepal, Durham University and the University of Stirling, was invited to participate in a UNESCO-sponsored mission of post-disaster surveys and rescue excavations across earthquake-damaged monuments and areas within the UNESCO Kathmandu Valley World Heritage Property, including Hanuman Dhoka.

2. Earthquake Damaged Monuments in the Durbar Square at Hanuman Dhoka

Hanuman Dhoka has a far broader range of monuments within its Durbar Square than either Patan or Bhaktapur on account of it having hosted one of the Malla's Kathmandu city-states and then having acted as the capital of the Shah Kings from 1768 CE when they moved to Narayan Hiti (Slusser 1982: 76). As noted above, many of the sacred and secular monuments within Hanuman Dhoka's main Durbar Square were destroyed or damaged during the Gorkha Earthquake. Indeed, the Government of Nepal's Department of Archaeology published a '*Preliminary Report of Monuments Affected by the Earthquake*' and recorded that of the complex's 97 protected monuments, 11 collapsed and a further 39 were damaged (Gautam 2015: 4)(Figure 2). Sadly, this list included the Kasthamandap, reputed to be both the Valley's oldest standing building before its collapse and the monument which gave its name to Kathmandu itself (Slusser and Vajracarya 1974: 206-7) but also included the seventeenth century CE Trailokya Mohan Temple, the three-roofed Maju Dewal, Riddhi Laxmi's Shiva Temple, the Kamdeva Temple and Laxminarayan Joshi's Vishnu Temple (ibid.). The seventeenth century octagonal Krishna Temple also collapsed and Queen Bhuvan Laxmi's Kakeswor Temple was badly damaged. The statue of one of the principal patrons of the Durbar Square and his family, King Pratap Malla (r. 1624-1674 CE), was also damaged when its stone pillar fell. Gautam's report also recorded that many of the ancillary courtyards and monuments within the multi-period palace complex had also been damaged with the top two floors of the nine story Basantapur tower collapsing as well as part of the facade of the neo-classical style Rana period Gaddi Baihak, built in 1908 (Figure 3). The famous Hanuman image was undamaged but is currently protected by a complex of struts and bars (Figure 4). In response to the clear academic and public interest in the rapid reconstruction of the Kasthamandap, the ruins of that building were selected for rescue excavations. Indeed, its importance had long been stressed by Slusser and Vajracarya, who highlighted its significance as "the largest *dharmasala* in the Kathmandu Valley, or indeed of any type of building – palace unit or temple – in traditional Newar style." (ibid.: 180).

3. Archaeological Excavations at the Kasthamandap and Hanuman Dhoka's Durbar Square

Maru Tol is a small square to the south-west of the royal Palace complex at Hanuman Dhoka and covers an area of some 1,500 square metres. Pencil drawings by Rajman Singhe in 1844 (Gutschow 2015: 113) and watercolours by Henry Ambrose Oldfield in the 1860s show the presence of low subsidiary structures abutting the south-east corner of the structure and the latter that the square was paved with brick or tile. Oriented to the east, the Kasthamandap, or Maru Sattal, is located in the centre of Maru Tol between the Maju Dega stepped temple to the north, the Sinha Sattal to the south, the Kavindrapur to the east and the Shiva sikhara-style temple to the west (Korn 2007: 92). Its location is often noted as being at the junction of the main urban units of the ancient settlement of Kathmandu itself, or rather of its three separate elements or *svamdesa* (Slusser and Vajracarya 1974: 206). Whilst the Kasthamandap hosts a later shrine to Goraksanatha in the centre of its ground

floor, it was originally designed as a *sattal* or public rest house (ibid.: 169) but may also have performed the role of a royal council hall and coronation pavilion (ibid.: 209). There is some debate as to its original construction with Slusser and Vajracarya noting that “We cannot establish an exact date for the foundation of Kasthamandap. But circumstantial evidence almost certainly points to a time anterior to, or in, the early twelfth century AD...characterised by political anarchy in which the Kathmandu was fragmented into innumerable states or “kingdoms” even more petty than the city-states of the late Malla period” (ibid.: 206).

Whilst Bernier suggested a later date of 1596 CE (1970: 145), most other scholars have accepted the early foundation with Korn referring to Kasthamandap as “the oldest of all surviving superstructures” and that some parts of its superstructure may “date back to the first time of its mention in the early 12th century” (2007: 128). Indeed, Amatya refers to the reference to its name in the Namasangiti dating to 1143 CE (2007: 60) and Thapa noted its recurrence in the twelfth century CE Paramartha Namasangiti before coming to represent to the whole area around the monument (1968: 33). Thapa also cited a number of its copper and silver plate inscriptions dating to 1303, 1464 and 1484 CE (ibid.: 34). One of the later ones refers to the location of the monument on the east bank of the Vishnumati River (ibid.). Referring to its attribution to Lakshmi Narasimha Malla, Thapa comments that “It is very striking that there is no record whatsoever of the construction or repairs that he might have carried out” and suggests that the installation of the Goraksanatha shrine was a relatively late event (ibid.) in agreement with Slusser and Vajracarya’s note of the monument’s gift to Kapalikas in the fourteenth century CE (1974: 210). It is important, however, to note the structure’s other affiliations with the Lords Pacali and Ganesh as well as with Newar Buddhists (ibid.: 209).

Advocating a foundation of 1143 CE, Slusser and Vajracarya have suggested whilst piecemeal repairs and renovations must have been undertaken over the years, the “great platform and its four central columns” are original elements (1974: 207). Korn also acknowledged that many of the timbers may have been renewed”, although its appearance may have “changed through the centuries” (2007: 135). He also described the 16.3 metre high monument as comprising three open halls, one on each floor above the other. His measurements of the structure identify that its base was 18.7 by 18.73 metres with the core “formed by four massive wooden posts” and four brick quoins running through the first and second floor (ibid.). With reference to his line drawings, the quoins were L-shaped and measured 1.5 by 1.5 metres with a width of about 0.75 metres whilst the four central pillars formed a square measuring just under 4.5 metres. Bernier noted that there were additional double capitals supporting the extension of the beams beyond the central square, functioning “to further distribute support beneath the ceiling” (1970: 146). He also interpreted its wide balconies and raised corner platforms as confirmation of its original function as a rest house (ibid.: 145). Accessed from all four directions, the main staircase descends to the east and is flanked by a pair of lions. Little has been written about the

monument's foundations with Banerjee referring to its almost exceptional design, resting as it does on a single plinth (1980: 115) and Thapa notes that clay was used as the mortar for its walls and roofs (1968: 33).

Banerjee stated that the repairs to the Kasthamandap in 1966 formed the first major conservation activities of the Department of Archaeology "jointly with, and under the entire financial support of, the Suthi Samsthan" (1980: 151). More detail is provided by Amatya, who described how the building had been occupied by 45 families until their subdivisions and party walls were removed during the 1966 renovations. Far from representing squatters, Slusser and Vajracarya attributed their affiliation with the monument as descendants of Goraksanatha's yogis who had been presented with the deeds to the Kasthamandap in 1379 CE (1974: 210). Exposing the original plan of the structure, portions of the wooden balconies, tiled roofs and timbers were repaired and replaced (Amatya 2007: 61). Amatya also noted that the structure was further repaired by the Department of Archaeology between 1999 and 2000.

In agreement with UNESCO and the Department of Archaeology, Government of Nepal, it was decided that we would excavate within the collapsed remains of the Kasthamandap in order to understand more about its foundation and construction sequence in advance of reconstruction. Therefore, at this location, no excavation was undertaken across the square but such interventions are recommended in future to assess the subsurface heritage of Hanuman Dhoka in tandem with the results from Ground Penetrating Radar survey. The initial trench initially measured four metres east to west and five metres north to south but was later expanded becoming an irregular sized trench measuring 13.90 metres north-south and 10.35 metres east-west at its greatest extent (Figure 5).

Following the collapse of the Kasthamandap and the subsequent clearance and recovery efforts, the footprint of the monument was reconfigured by volunteers utilising rubble to form a wall where the outer plinth had been bulldozed away. This temporary wall designated a slightly larger area than the original footprint and acted to retain a mixture of brick, tile, stone and concrete behind as well as clay from the roof construction (Figures 6 and 7). Once we had removed the rubble wall from the trench's location, we found evidence of the post-disaster deployment of the JCBs and bulldozers in the form of a very large cut which had removed the southern plinth of the monument as well as in situ subsurface archaeological material originally sealed below its tiled floor. We cleared portions of the remaining tiled surface of the monument, which was covered with debris from the collapse and subsequent clearing by the bulldozer and JCBs. Dating to the 1966 renovation campaign, we found that in places the tile flooring had been damaged by the buckets of the machinery with marks evident in places (Figure 8). We sieved the mixed material from collapse and reconfiguration carefully and recovered tile, brick and carved wood elements as well as modern materials, including surgical gloves, masks, needles and IV lines associated with the blood donation session held at the monument on the 25th April

2015 (Figure 9). As the sides of the exposed cut were rubble and thus unstable, we reduced the width of the trench to two metres and concentrated in the area where the archaeological sections would be more robust and safer once the team worked at a lower depth.

The tile floor was set onto a bed of surkhi, which in turn had been laid over a modern brick pavement. This brick paving had itself been bedded in cement directly above a layer of carefully laid reused roof tiles. The tiles were, in turn, laid on an irregular surface of Rana stamped bricks which were bedded on firm silty deposits below. Associated with a major period of renovation, once we removed the bricks, we were able to identify a series of post holes cut into underlying silty deposits which we assume to have been associated with the ancillary walls and subdivisions mentioned by Amatya (2007: 61)(Figure 10). Once we had removed these multiple layers of brick and tile layers from the vicinity of the trench, we were able to start interpreting the series of walls exposed within the foundations of the ancient monument.

The most evident of these was the massive one metre thick and two metre deep wall which formed the core foundation for the monument. Indeed, it actually underpinned the apparently independent four L-shaped corner brick quoins and rows of paired saddlestones between them (Figure 11). Measuring an estimated 12 by 12 metres, this exceptionally well-built foundation was constructed of bricks laid in clay mortar. The bonding design of the wall involved placing two stretchers on the prepared ground surface and then following them with two headers, two stretchers and so on. After 12 courses, the wall was stepped and the pattern resumed, comprising three sets of 12 courses. We were unable to identify any signs of damage to this massive foundation relating to the recent or previous earthquakes and the only recorded damage was a direct result of the bulldozers and JCBs during the immediate post-earthquake emergency recovery stage. During the excavation of the lower levels of the wall, it became clear that the foundation wall had been constructed within a cut into underlying clay layers, both cultural and natural, but was only visible to the exterior of the monument.

When we excavated to the north of this massive wall, in the interior of the monument, we identified a second major construction feature of the original monument – a massive freestanding brick pier. Underlying the large southwest saddlestone, which had supported one of the monument's four central wooden pillars, we exposed the 2.01 metre deep brick pillar with a width of c. one by one metres. Comprising 35 courses of brick set in clay, the exposed brickwork was extremely well preserved and showed no evidence of displacement or earthquake distortion (Figure 12). The brick bond was similar to that of the inner foundation wall and comprised patterns of two headers and two stretchers. Whilst excavating and cleaning these two foundation elements, it became clear that the Kasthamandap had been subjected to a major phase of secondary construction after its original establishment. This had involved the placing of four bracing cross-walls between

the freestanding pier and the massive outer foundation wall and, we assumed, the other piers (Figure 13). These cross-walls were only one brick thick but also went down to the same depth as the original foundations, 2.01 metres. Running between piers and the foundation wall, the cross-walls abutted the main foundation, not cutting into it, and most also abutted the brick pier, though one east-west cross-wall did cut into the upper courses of this pier. Moreover, the bricks were laid in a different bond of only headers.

During the excavation, it also became clear that this secondary phase had also included the placing of the main southwest saddlestone above two courses of new brickwork on top of the old pier. The fact that the saddlestone was placed on two courses of newer brick and did not sit centrally on the brick pier below indicates that it is possible that the saddlestones were brought to the site from elsewhere or that it were reset, but only additional research will clarify this. However, it became clear that this secondary phase of alterations associated with the construction of the cross-walls had involved the removal of the entirety of the material within the 12 by 12 metre foundation wall and its subsequent refilling and repacking, as the originally foundation cut within the brick foundation wall was not present – a major undertaking.

The saddlestone measured 0.50 metres square with a raised central square of 0.37 metres. The mortise socket for the wooden pillar's tenon tongue had been cut into the centre of this raised area and measured 0.14 by 0.14 by 0.14 by 0.135 metres and 0.06 metres deep. The presence of a roughly square copper alloy residue on the raised square portion of the saddlestone suggests that original wooden pillar was separated from its saddlestone by a copper alloy plate, perhaps acting as a damp proof course (Figure 14). Indeed, we identified one of the original central timber pillars from the Kasthamandap within the Durbar Square and found that it measured 6.2 metres long and 0.39 square. At the upper end of the pillar, it was equipped a 0.13 metre deep mortise socket and at the base of the pillar with a 0.07 metre long tenon tongue measuring 0.12 by 0.11 metres. This indicates that wooden tenon and stone mortise joint was designed to leave a small gap between the two, again perhaps a way of preventing moisture from leading to the rotting of the base of the timber pillar.

During our excavations, we also successfully identified the location of the main northwest and southeast saddlestones – whose central sockets were all set at a distance of 4.28 metres apart, forming the structural core of the Kasthamandap. The saddlestone and sockets were similar in size and shape and also had evidence of the copper alloy residue from the now corroded plates. When the mortise sockets of the three main saddlestones were excavated, we recovered a small inscribed gold foil disc from each, although crumpled. The best preserved, Sf 750 appeared to have been inscribed with a series of circular rings and lines, seemingly forming a mandala (Figure 15). When related to the presumed mandala formed by the cross-walls, the physical evidence at Kasthamandap suggests that elaborate construction rituals were conducted during the construction and renovation of this monument.

At the base of the cross-walls, brick pier and large foundation wall we identified evidence of pre-monument construction human activity. Below the homogenous fill material that was deposited within the cross-walls and foundation, was a smooth clay that might represent the natural. This ran underneath the cross-wall east-west cross-wall within the larger area of the trench. Very clearly, a rounded feature also cut into this material, to the east of the trench. Cut into the sterile clay, this feature contained inclusions of charcoal and ceramics. It was not fully excavated as water was reached at this depth and waterlogging also caused concerns of undermining the cross-wall and damaging the architectural integrity of the Kasthamandap foundations. This feature indicated that there was cultural activity at the site prior to the construction of the brick walls at the site (Figure 16)

The area of the trench to the south of the massive foundation wall was much less well preserved due to the extensive damage from the JCBs and bulldozers and we estimate that some 30% of the monument was destroyed during the initial two day post-disaster recovery stage. As mentioned above, the southern side of the 12 by 12 metre foundation wall had been partly damaged by machinery which had cut down through the monument's tiled floor damaging much of the in situ archaeological deposits below. We were, however, still able to identify that the base of the foundation wall had been cut down into underlying cultural and natural deposits (Figure 17). These clearly layered deposits were truncated on the north by the massive foundation wall and on the south by another brick wall, marking the southern edge of the Kasthamandap's massive platform (Figure 18). Surviving to a maximum height of 11 courses, the outer wall's bond was the same as that of the inner foundation wall and we assume that both were constructed at the same time. However, whilst the inner wall was remodelled, there is no evidence of the material between the inner and outer walls being removed as it still preserves in situ archaeological deposits. This is not to suggest that the outer wall has not been remodelled as we identified at least two phases to its one metre thickness (Figure 19). This indicator of the southern edge of the monument was later augmented by a modern brick plinth which preserved below it a worn portion of the original basket-weave pattern of the old brick paved Durbar Square (Figure 20).

4. Geoarchaeological Analysis at the Kasthamandap

The post-disaster phase of archaeological assessment of the Kasthamandap has not only provided information for engineers and architects as to the design of the structure's foundations but it has also offered a unique opportunity to develop new understandings of the early landscape below. Working with site stratigraphies, our analyses commenced with geoarchaeological-based field descriptions using Munsell colour (including mottle colours), texture (particle size and sorting), structure (soil organization), and frequency of cultural

inclusions (in this setting primarily fine charcoals, brick and pottery fragments). We have also extracted Optically Stimulated Luminescence (OSL) samples for scientific dating and Kubiena tins for micromorphological analysis of microstratigraphy. Whilst we are still undertaking our analyses of the samples, preliminary observations indicate a distinct transition from sediments with common charcoal frequencies in the lower part of the stratigraphy to sediment dominated by brick inclusions, similar to the transitions noted at Bhaktapur (Coningham et al. 2016a).

Our excavations at the Kasthamandap have demonstrated clear phases of construction and we are fitting these into a chronological framework through geoarchaeological investigation, integrating OSL dating and thin section morphology with particle size distribution analyses to characterise the sediments being dated. As at Bhaktapur (Coningham et al. 2016a) and Patan (Coningham et al. 2016b), we are working on dating the surfaces beneath the walls, fill material that has been added to close cuts where walls have been inserted or used to fill larger foundations spaces, and wall brick itself. Our assumption is that underlying surfaces, infill material and brick will give the same dates for a particular wall and our sampling will permit triangulation of dates to optimize accuracy. In undertaking micromorphology and particle size distribution analyses, we will quantitatively assess the degree of similarity between the fill materials together with the degree of preparation of underlying wall surfaces as a way of determining whether walls are associated with different cultural sedimentary environments and thus of likely different ages. The triangulation approach adopted here will provide the first comprehensive approach to wall dating in medieval and later urban sites in the Kathmandu Valley. Although we are still processing the samples, preliminary results suggest that the initial brick foundations of the Kasthamandap were constructed in the seventh century CE but that within 200 years the structure was subject to a major renovation with the removal of the central fills of the structure and the placing of bracing cross-walls. As significantly, the underlying cultural deposits from the sequence found between the foundation wall and wall to the south, defining the extent of the monument, indicate that the site was already subject to human activity in the second century BCE. Not only does this suggest earlier human activity at the site, but also a foundation for the Kasthamandap much earlier than the twelfth century CE dates previously suggested.

5. Ground Penetrating Radar Survey

GPR survey was commenced across 2,009 square metres of Hanuman Dhoka's Durbar Square and a total of 80,360,000 individual data values were recorded in 13 survey areas to a depth of two metres. We used a Mala GPR system to investigate, comprised a X3M control unit, a XV data monitor, a 500 MHz shielded antenna and a Rough Terrain Cart. Three areas within Hanuman Dhoka were investigated with Ground Penetrating Radar

(GPR): (a) around the Kasthamandap; (b) east of the Maju Dega Temple, up to the palace; and (c) south of the palace complex (Figures 21 and 22). The GPR results next to the Temple and Kasthamandap are dominated by linear anomalies that are all interpreted as modern utilities, either for freshwater, sewer or electric cables. Unlike in Bhaktapur (Coningham et al. 2016a), the anomalies show as strong reflections (black) and it is hence assumed that the pipes themselves are imaged. All extended anomalies next to these linear features are also interpreted to be of modern origin, probably forming the interconnection of structures for the utilities. Some of these coincide with metal man-holes or grills that were noted during the Total Station survey. In the southern part of the Maju Dega area, several of these linear anomalies appear interrupted for no apparent reason.

Next to the Kasthamandap, the only remaining anomalies that may be of archaeological origin are those to the west of the Temple in the narrow alleyway; and underneath the platform south of the structure. The latter show the edges of a bulge with c. 2.5 metre diameter that gradually becomes smaller with depth. Similarly, there are slightly extended areas of high reflectivity to the north of the Maju Dega Temple and these may be of archaeological origin. To the west of the palace gate, are several separate areas of high reflection that may represent a destruction layer below one metre depth. South of the palace complex, an intriguing set of anomalies is recorded. Most prominent are two linear anomalies running east-west visible over c. 60 metre length, each 0.8 metres wide and with a centre-line separation of two metres. The most likely interpretation is that they are walls or wall foundations. In addition, there are two narrow linear anomalies (c. 0.15 metres wide) running south of the former at a slightly different angle. Their interpretation is uncertain but they could be utilities, connecting to the two square modern anomalies to their east. In addition to the two long wall-like anomalies, there are further extended anomalies in this survey area that may together represent former building structures.

6. Provisional Archaeological Risk Map for Patan's Durbar Square

The archaeological investigations at the Kasthamandap and within Hanuman Dhoka's Durbar Square have illustrated the extent of subsurface heritage within the World Heritage site. The GPR survey has highlighted areas of potential archaeological features below the current square and excavations have revealed the character of some of these signatures. What is clear is that the Durbar Square was not always an open space but has developed over time, only in the last few centuries reaching its current configuration of standing monuments. One of the key features identified through GPR survey and excavation were pipelines and other amenities running through the Durbar Square, which we have demonstrated have cut through archaeological stratigraphy and earlier phases of human activity. Such interventions are therefore a concern as the laying of any infrastructure has the potential to damage and destroy subsurface heritage of this site of Outstanding

Universal Value. Indeed, we documented two examples of post-disaster interventions whilst within the Hanuman Dhoka. The first was represented by the cutting of evaluation trenches into the foundations of the Palace complex by engineers and architects without any archaeological recording (Figure 23). The second involved the cutting of foundations for new lampposts by the Municipality, again without any archaeological recording (Figure 24).

The damage caused by the earthquakes will require reconstruction and also the repair and laying of amenities in Hanuman Dhoka and whilst we do not recommend the suspension of the laying services and reconstruction we do advocate the mobilisation of rescue archaeology teams to undertake rescue excavations in advance of interventions (Coningham et al. 2016c). The Archaeological Risk Map for Hanuman Dhoka will provide information for site managers and stakeholders as to the risks posed to subsurface heritage and help guide future development (Figure 25). Indeed, from our observations and investigations, we feel there needs to be a heightened awareness that the cultural heritage of Hanuman Dhoka is not restricted to its standing remains and architectural treasures but that it should extend also to the foundations of these monuments and to preceding phases of cultural development, which are found below the current ground level. The Archaeological Risk Maps and our interventions should facilitate the development of this awareness and protect subsurface heritage whilst not being of detriment to reconstruction.

7. Discussion and Conclusion

One of Kathmandu's most significant monuments, our rescue excavations at the Kasthamandap have provided invaluable new data for architects, engineers and historians. Indeed, initial our findings indicate that the Kasthamandap's brick foundations were probably originally laid in the c. seventh century CE but that within 200 years, it had been subject to a major campaign of remodelling with the introduction of bracing cross-walls. This much earlier date indicates that the Kasthamandap's foundations may be attributed to a late Licchavi date, even if one favours the later range of the OSL dates. Reflecting on Slusser's earlier comment that "most of the principal national shrines, the temples and stupas, can be traced to Licchavi foundations, for the most part the superstructures represent restorations...the many scattered architectural fragments above ground attest to the splendour of Licchavi architecture" (1982: 39), we can now attest to the fact that the ground plan of the Kasthamandap had been firmly established by the beginning of the Transitional Period in 879 CE. The monument's multi-celled foundation potentially shares a similar construction with Patan's Char Narayan Temple (Coningham et al. 2016b), suggesting a common technique across the Kathmandu Valley. Designed with brick cores, the cell walls created platforms above which timber, tile and brick superstructures were erected. In most cases, these foundations are resilient and undamaged by the 2015 earthquake and previous

seismic events, and the collapse of many monuments may be linked to superstructure maintenance issues.

The Kasthamandap's bracing cross-walls not only offer a structural strength but the postulated resultant plan is also of nine units or cells, three north to south and three east to west. Initiated and then refilled with sand and clay and the central saddlestones and cardinal rows of double pillar saddlestones between the brick quoins laid above the original massive foundation wall. The resultant mandala-like pattern may have ritual and symbolic meaning and our cleaning of three central saddlestones demonstrated that their pillars had originally rested on a copper alloy plates, perhaps forming a damp course but the mortise socket of each saddlestones had been equipped with a gold foil mandala. Such objects are relatively rare and, in her review of consecration rituals in Asia, Slaczka noted 200 examples from the eighth to the fourteenth century CE (2007: 2). Her evidence suggests that elaborate rituals were conducted across the region and treatises, like the twelfth century AD Kasyapasilpa, indicate that deposits, or *garbhanyasas*, provided "life-breath" to a building (ibid.: 84) and prosperity and welfare to those performing the ceremony (ibid.: 201). Other texts describe the placing of gold under main pillars (ibid.: 212), perhaps relating to rites of cosmological significance, such as creating an axis mundi (ibid.: 212-213).

Reference should also be made to the similar, though smaller, foundation (S21) excavated by the Italian mission at Harigaon Satya Narayana between 1984 and 1988 (Verardi 1988). Measuring 2.2 metres square and surviving to a depth of 0.66 metres, S21's square foundation walls and cross-walls formed nine square pits (ibid.: 65). Verardi dated the framework of walls to the Transitional Period walls (ibid.: 68) and clearly recognised them as forming a *navakunda*, "a mandala subdivided into nine padas, which is one of the models envisaged in the traditional treatises on Newar architecture" (ibid.: 65). As at the Kasthamandap, Verardi found the nine *kundas* filled with sterile sand and recorded contemporary rituals within the Valley, which involved the "custom of constructing foundation walls with nine pits in a sacred building...After the prescribed ritual, the pits are filled with sand or earth. The ritual documented...prescribes that in each pit nine different kinds of grain are thrown...According to another recorded ritual, it is the powder of the *pancarangis*, or 'five minerals' (gold, silver, copper, brass and iron)...which is thrown in the kundas. The foundation of the sacred building, conceived and laid in the above way, is then sealed with a paved floor after having been consecrated" (ibid.). Initially interpreted as the foundations for a small temple, he later suggested that they had formed the base for a stupa, which was later entirely destroyed in the eighth century CE (1992: 78). This reinterpretation was later critiqued by Tiwari, who stated that it formed the sacred foundation for a square temple (2002: 111), and this bears a remarkable similarity to what was uncovered in the foundations of the Kasthamandap during our recent excavations.

As noted above, we have identified that, in many cases, the foundations of Kathmandu's structures are exceptionally resilient and have not been damaged or distorted by the 2015 Gorkha earthquake or previous seismic activity. As a result, the collapse of a number of Kathmandu's monuments is more probably linked to maintenance issues within the timber, tile and clay superstructures. Indeed, whilst we had successfully identified the location of saddlestones supporting three of the Kasthamandap's central timber pillars, we could find no trace of the fourth. Missing from the north-east corner of the monument's core, we were only able to locate its position by a set of concave tiles, distorted by its weight. The 6.2 metre long pillar itself was located and we noted that neither end had a tenon tongue; one end had a mortise socket but the other end was badly rotted. This indicates that the Kasthamandap's superstructure rested on three locked mortise and tenon joints but one mobile one, weakening the building.

In conclusion, despite the fascinating results from our short rescue excavations at the Kasthamandap, providing a clear structural sequence, we acknowledge that they are based on a small trench within the monument. As a result, we strongly recommended that the foundations of the entire monument are exposed, which would allow its construction to be fully understood and would also remove the debris from the JCBs. Accompanied by material analysis, the monument could provide an exemplar for reconstruction and the use of traditional technologies. The location of the missing fourth central saddlestone should also be investigated as this element is a critical feature, both in the collapse of the monument and its successful reconstruction. The larger excavation trench would not only provide sequences but also architectural plans to illustrate the character of development of subsurface architectural phases of the site. The results clearly highlight the risk to the site's subsurface archaeological heritage and the necessity for archaeological interventions prior to any development or reconstruction work at the site (Figures 26 and 27). The architecture of the Licchavi Period is poorly understood and if the Kasthamandap is rebuilt without further rescue excavations, one of the most promising locations will have been destroyed.

In addition, we must acknowledge the complicated archaeological sequence and evidence of multiple phases of activity demonstrated by the GPR survey highlights the vulnerability of the subsurface archaeological heritage across Hanuman Dhoka's Durbar Square and the necessity for archaeological interventions prior to any development or reconstruction work. The excavation of a slot trench across the Durbar Square would provide a useful focus for understanding the presence of subsurface monuments and educating stakeholder. Marking the subsurface path of walls in a different brick pattern would serve to inform visitors as to their courses as well as remind Municipal professionals and contractors as to their presence.

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Figures



Figure 1: JCBs clearing the debris at Kasthamandap on the 26th April 2015 (Image courtesy of Kai Weise).



Figure 2: The foundation plinth of the collapsed Maju Degu Temple in Hanuman Dhoka's Durbar Square



Figure 3: The collapsed Basantapur tower and damage to the interior courtyard at the Palace, Hanuman Dhoka.



Figure 4: The Hanuman Image at Hanuman Dhoka, photographed October 2015.

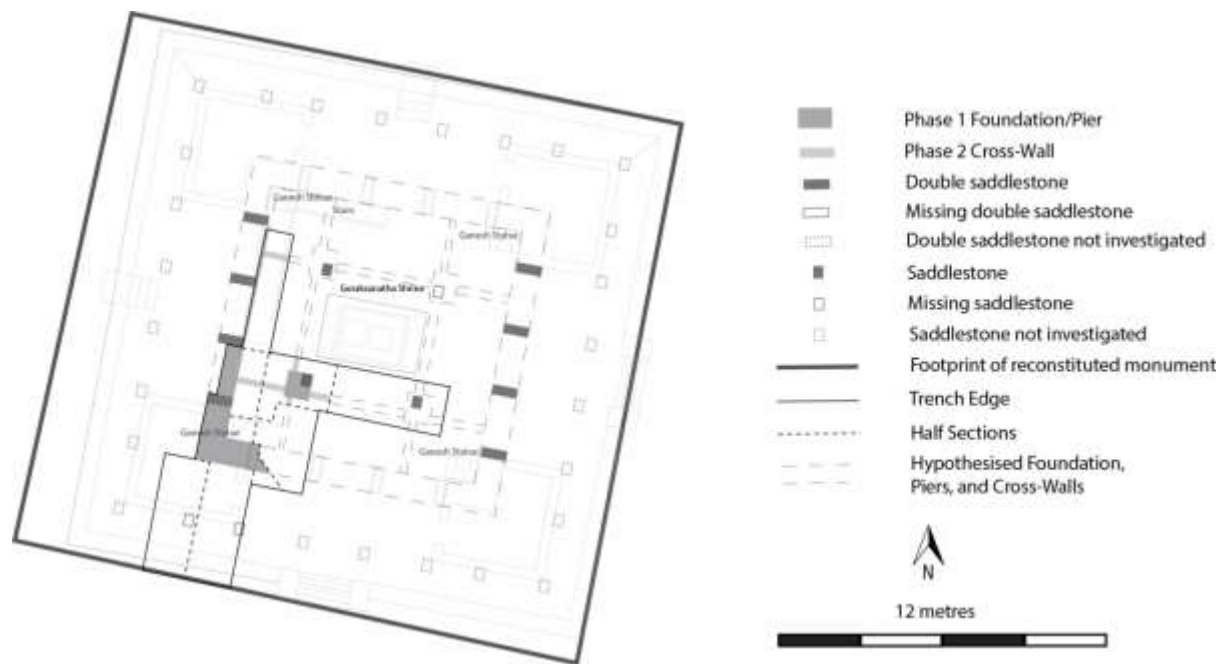


Figure 5: Plan of Trench at Kasthmandap.



Figure 6: The reconfigured footprint of the Kasthmandap on its eastern edge.



Figure 7: Reconfigured footprint of the Kasthamandap on its southern edge, where the Trench was located.

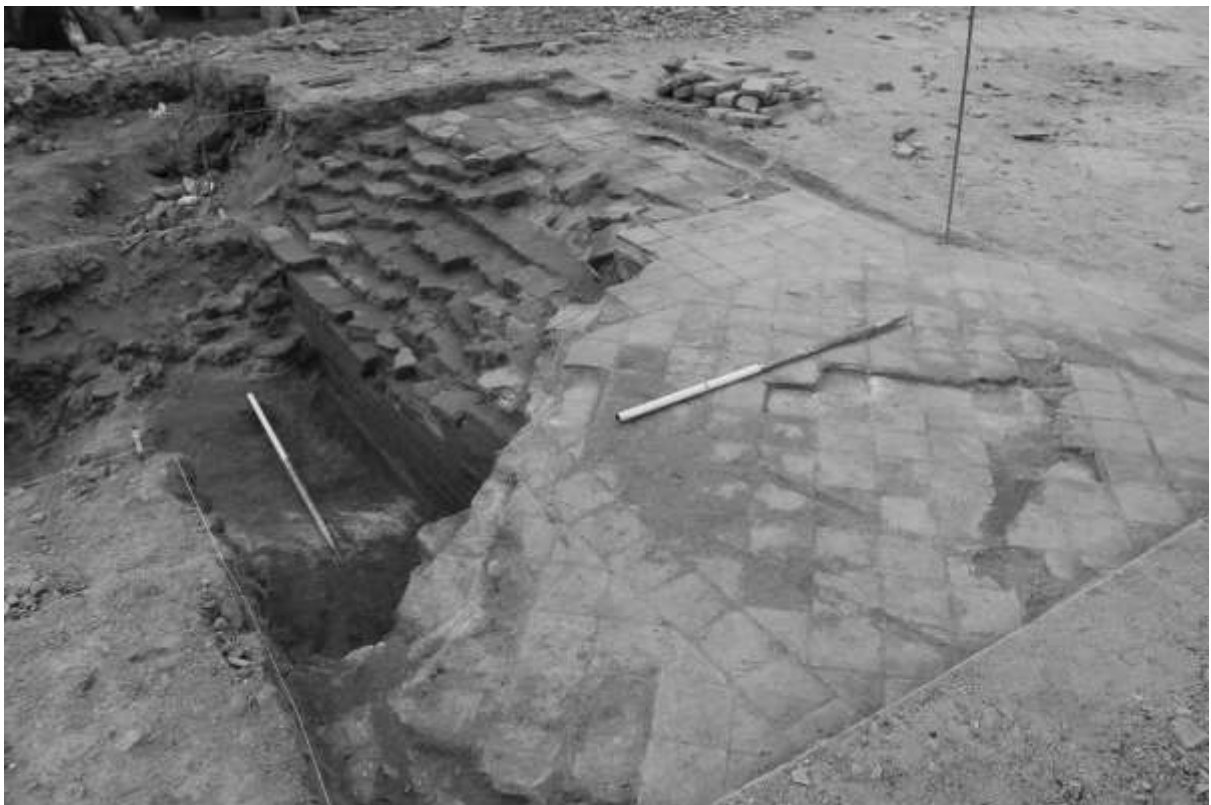


Figure 8: Clear marks from the bucket of machinery on the tiled surface, and cut through this tiled surface and foundation wall below, looking west.

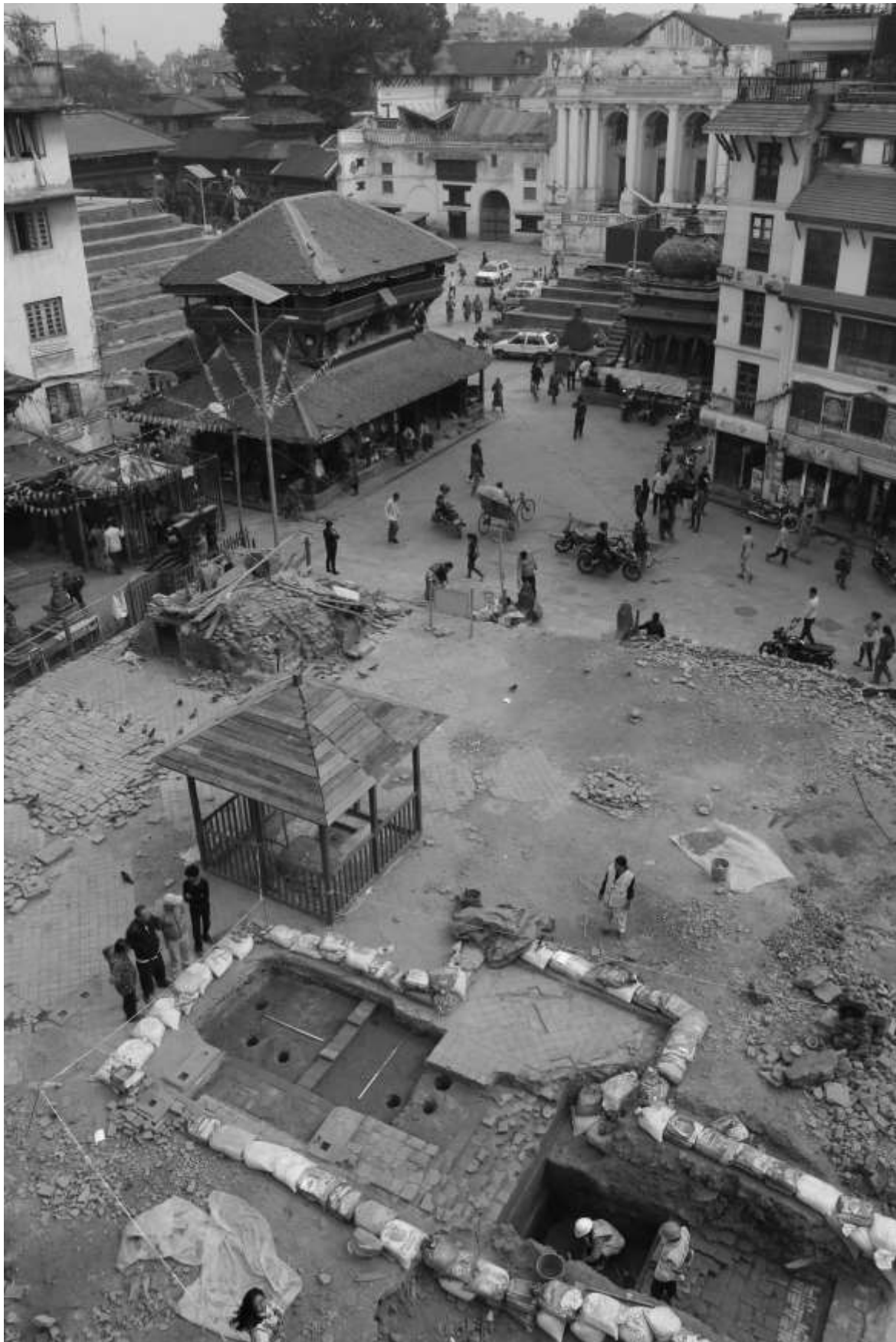


Figure 10: Postholes identified below the tiled surfaces at Kasthmandap, looking east.



Figure 11: Large foundation wall, looking north.



Figure 12: Brick pier below saddlestone, looking east.



Figure 13: Saddlestone with cross-walls connecting to the brick pier.

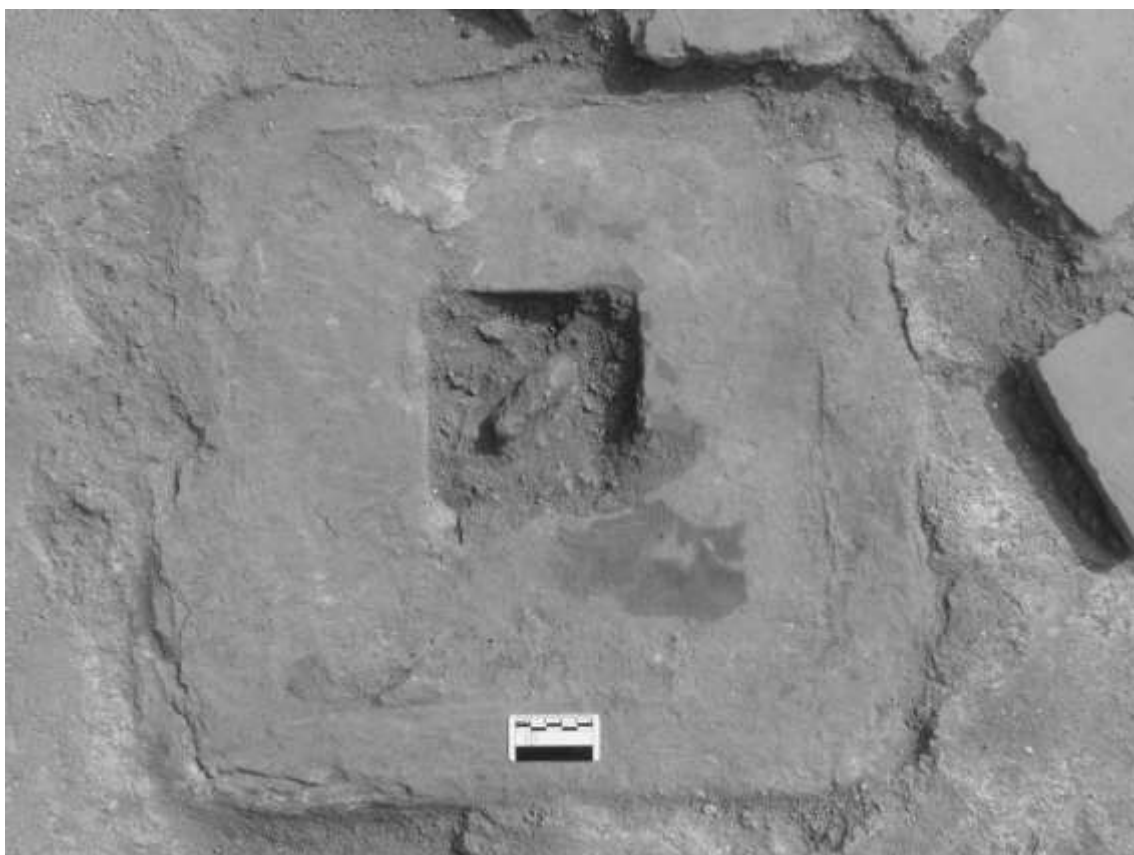


Figure 14: Copper corrosion visible on saddlestone.



Figure 15: Sf750, gold foil disc with mandala design.



Figure 16: Rounded feature visible below eas-west cross-wall within large foundations of Kasthamandap, looking west.



Figure 17: Earlier deposits in the east-facing section, cut by both the foundation wall (north) and exterior wall (south).

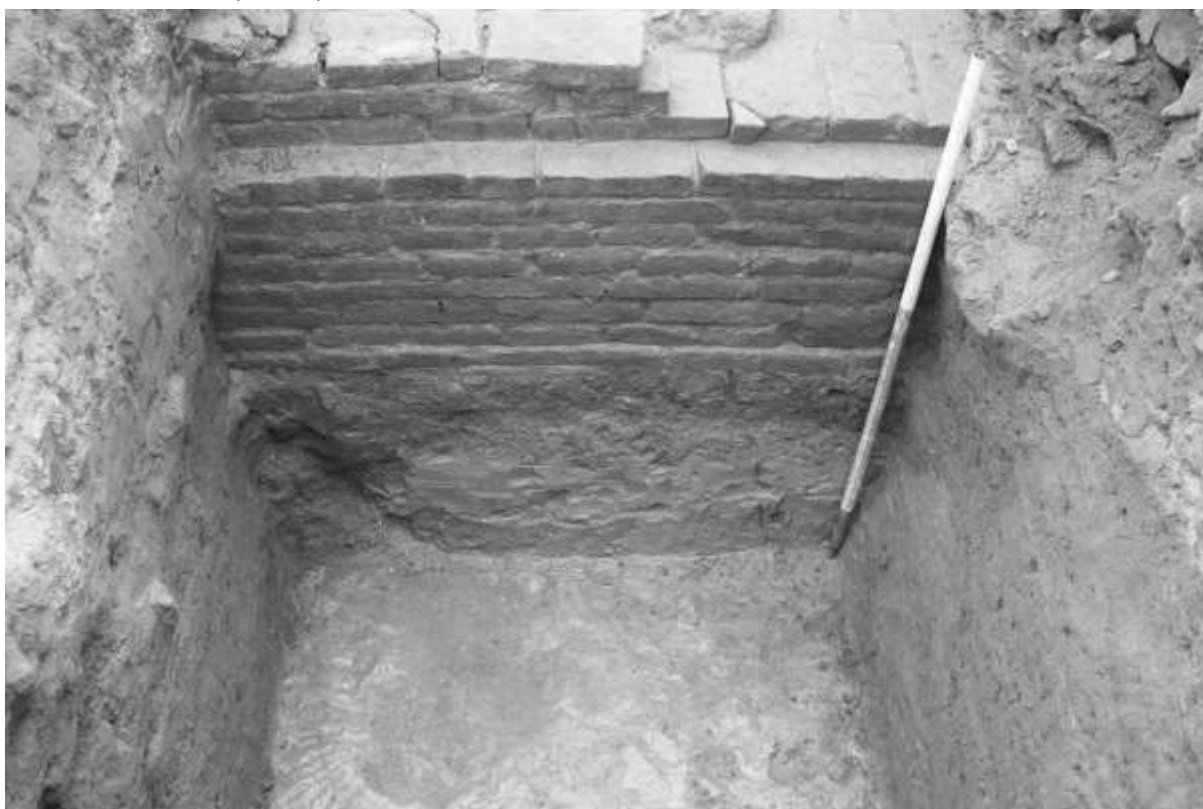


Figure 18: Brick wall to the south of the foundations of the Kasthamandap, looking south.



Figure 19: Exterior wall cut through to show an other phase of walling further to the south.



Figure 20: Basket-weave pavement found below the modern brick plinth, looking north.

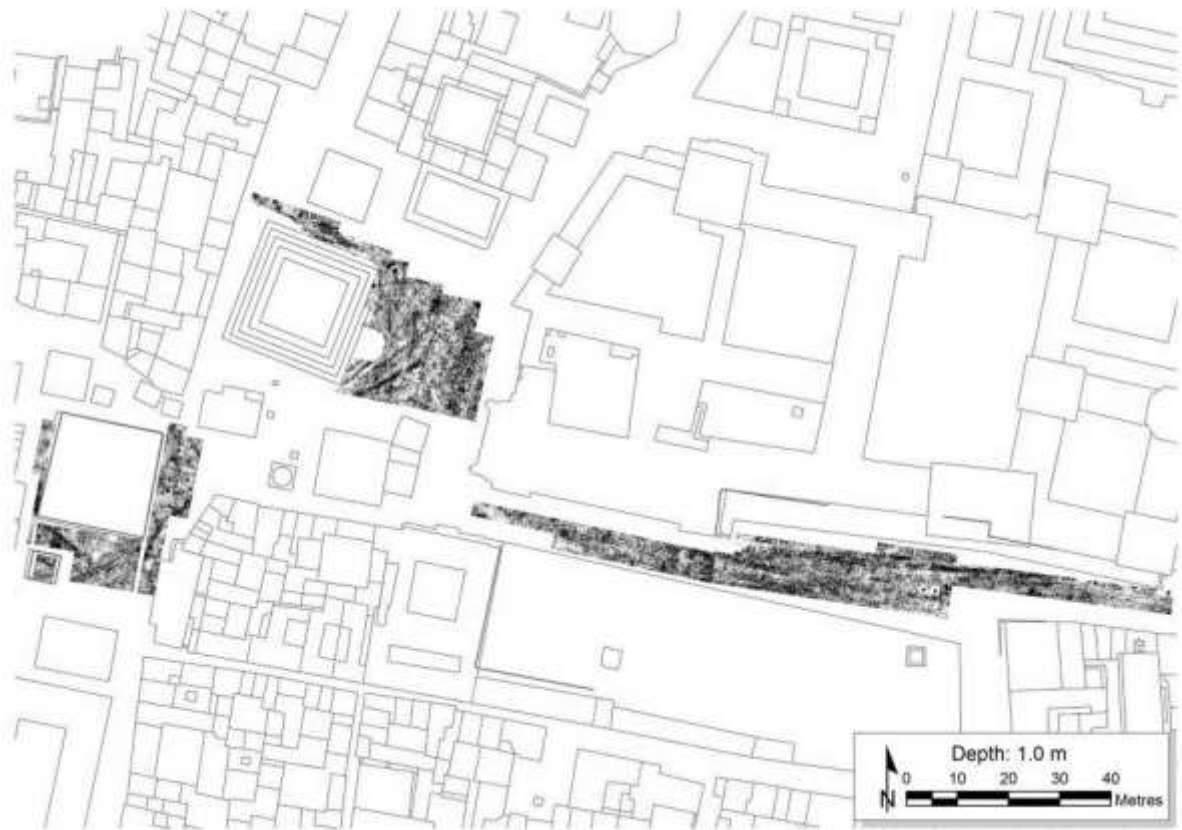


Figure 21: GPR survey results across Hanuman Dhoka's Durbar Square at a 1 metre depth.

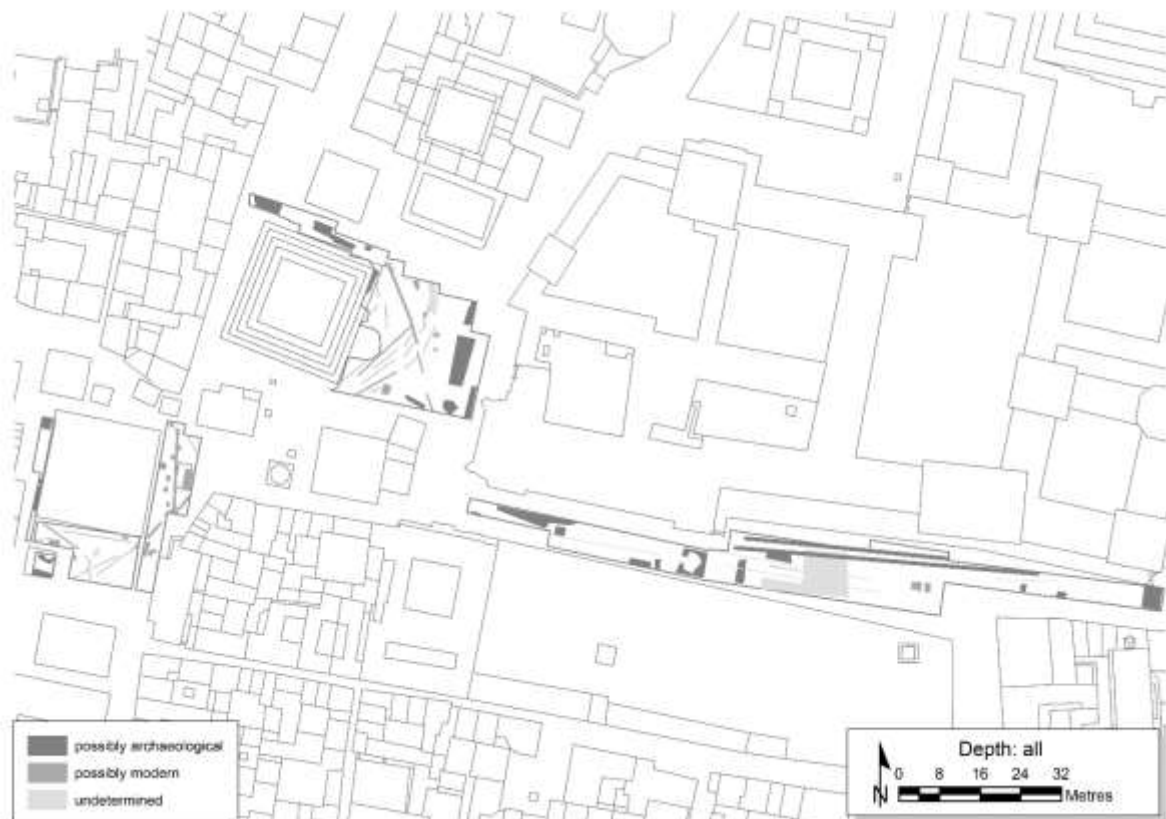


Figure 22: Archaeological interpretation of GPR results across Hanuman Dhoka's Durbar Square.



Figure 23: Unrecorded excavation trench cut alongside north facing wall of the Degutale Temple in Hanuman Dhoka's Durbar Square. Photographed in October 2015.



Figure 24: New lampposts installed on the corners of the Narayan Temple, Hanuman Dhoka Durbar Square.



Figure 25: Provisional Risk map for Hanuman Dhoka's Durbar Square.

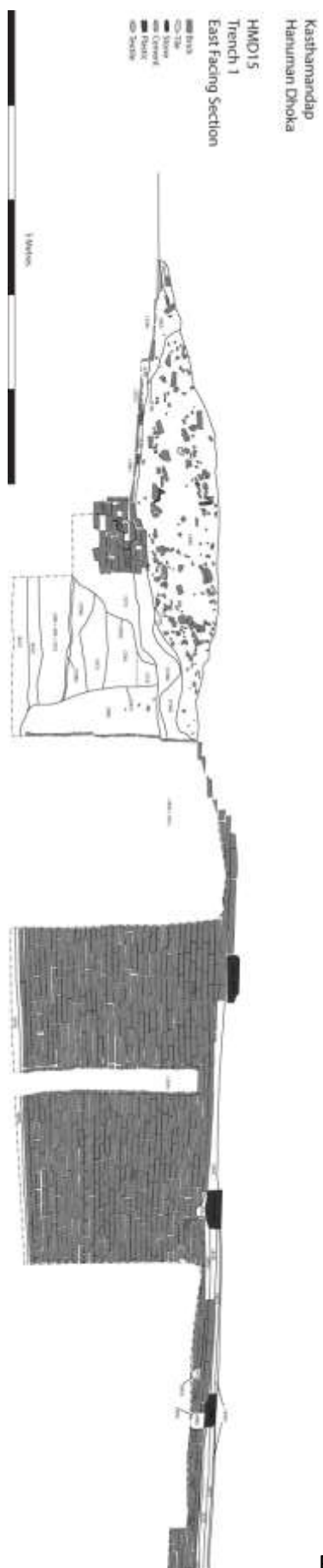


Figure 26: East facing section of Trench at Kasthamandap.

Kasthamandap
Hanuman Dhoka

HMD15
Trench 1
East Facing Section

-  Brick
-  Tile
-  Stone
-  Cement
-  Plastic
-  Textile
-  Wall Projection in Section
-  Brick Pier Location Projection

5 metres

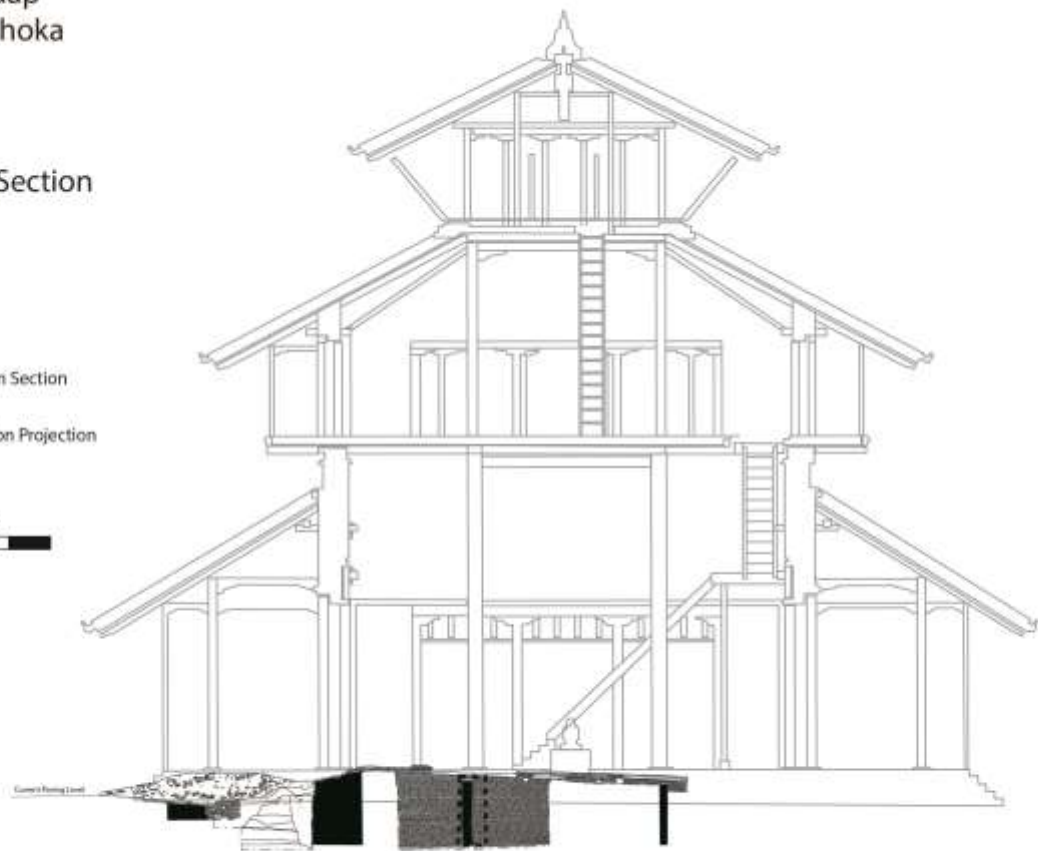



Figure 27: East facing section of Trench, illustrating depth of foundations, with superimposed elevation of the Kasthamandap before collapse (Elevation of Kasthamandap, after Korn 2007).